



WATER RESOURCES RESEARCH GRANT PROPOSAL

Project ID: RI2101

Title: Phytoremediation of Aged Aromatic Contaminants in Soil Using White Lupin

Focus Categories: Treatment, Toxic Substances

Keywords: Brownfields, Biodegradation, Phytoremediation, Aromatic Contaminants, Chelation

Start Date: 03/01/2001

End Date: 02/28/2002

Federal Funds: \$15,652

Non-Federal Matching Funds: \$31,305

Congressional District: RI 2

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Abstract

Soils contaminated with petroleum hydrocarbons, chlorinated solvents and their byproducts pose a risk to water quality in the glaciated Northeastern U.S. A combination of geomorphological features, such as shallow, coarse soils and a high density of hazardous waste disposal and "brownfields" sites represents a risk to both surface and ground water resources. Potential water quality degradation is associated with human health and economic risks.

Bioremediation of contaminated sites is often hampered by "aging" of contaminants, which results in their being sequestered into nanopores which are inaccessible to microorganisms. If this happens, the end point of the remediation effort may fall short of desired remediation goals and regulatory requirements. Nanopores reside in the iron oxide and hydroxides coating soil particles and contribute a large fraction of surface area to the soil. White lupin (*Lupinus albus*) produces citrate, a chelator, that complexes iron from its oxides and thus may modify nanopore structure. We propose to investigate whether white lupins can act to improve the efficacy of bioremediation of organic contaminants in soil.

A mesocosm experiment, conducted under controlled green house conditions, will evaluate whether white lupins can reverse aging, and whether effects are limited to the rhizosphere. We shall compare the persistence of model aromatic contaminants in treatments containing lupins with treatments that do not. Our research is an essential step toward designing remediation systems with multiple components whose actions synergistically complement each other to improve remediation efficacy.